

Claims

1. A method for desulfurizing a hydrocarbon fuel stream so as to convert the hydrocarbon fuel stream into a low sulfur content fuel, which low sulfur content fuel is suitable for use in a fuel processing section in a fuel cell power plant, said method comprising the steps of:
 - a) providing a nickel reactant desulfurization station which is operative to convert sulfur contained in organic sulfur compounds in the fuel stream to nickel sulfide;
 - b) introducing a hydrocarbon fuel stream which contains a molecular hydrogen (H_2) additive into said nickel reactant desulfurization station; and
 - c) said H_2 additive being present in said fuel stream in an amount which is effective to suppress carbon deposition on said nickel reactant and provide an effluent fuel stream at an exit end of said nickel reactant station which effluent fuel stream contains no more than about 0.05 ppm sulfur.
2. The method of Claim 1 wherein the H_2 additive is derived from a container of H_2 in the fuel processing section of the fuel cell power plant.
3. The method of Claim 1 wherein said H_2 additive is derived from recycled reformed fuel gas from a selective oxidizer in the fuel processing section of the fuel cell power plant.
4. The method of Claim 1 wherein said H_2 additive is derived from an electrolysis cell in the fuel processing section of the fuel cell power plant which converts water to H_2 and O_2 .
5. A method for desulfurizing a gasoline fuel stream so as to convert the gasoline fuel stream into a low sulfur content fuel, which low sulfur content fuel is suitable for use in a fuel processing section in a fuel cell power plant, said method comprising the steps of:
 - a) providing a nickel reactant desulfurization station which is operative to convert sulfur contained in organic sulfur compounds contained in the fuel stream to nickel sulfide;
 - b) introducing a gasoline fuel stream which contains a hydrogen (H_2) additive into said nickel reactant desulfurization station; and
 - c) said H_2 additive being present in said gasoline fuel stream in an amount which is effective to provide an effluent gasoline fuel stream at an exit end of said nickel reactant station which effluent gasoline fuel stream contains no more than about 0.05 ppm sulfur.
6. A system for desulfurizing a gasoline or diesel fuel stream so as to convert the gasoline fuel stream into a low sulfur content fuel, which low sulfur content fuel is suitable for use in a

fuel processing section in a fuel cell power plant, said system comprising:

- a) a nickel reactant desulfurization station which is operative to convert sulfur contained in organic sulfur compounds contained in the fuel stream to nickel sulfide;
- b) means for introducing a gasoline or diesel fuel stream into said nickel reactant desulfurization station; and
- c) a supply of a hydrogen (H_2) additive and means connecting said H_2 additive supply to said fuel stream, said H_2 additive being present in said fuel stream in an amount which is effective to provide an effluent fuel stream at an exit end of said nickel reactant station which effluent fuel stream contains no more than about 0.05 ppm sulfur.

7. The system of Claim 6 wherein said supply of H_2 additive is derived from recycled gas from a fuel cell power plant selective oxidizer.

8. The system of Claim 6 wherein said supply of H_2 additive is derived from a container of H_2 .

9. The system of Claim 6 wherein said supply of H_2 additive is derived from a hydride bed.

10. The system of Claim 6 wherein said supply of H_2 additive is derived from a water electrolysis cell.